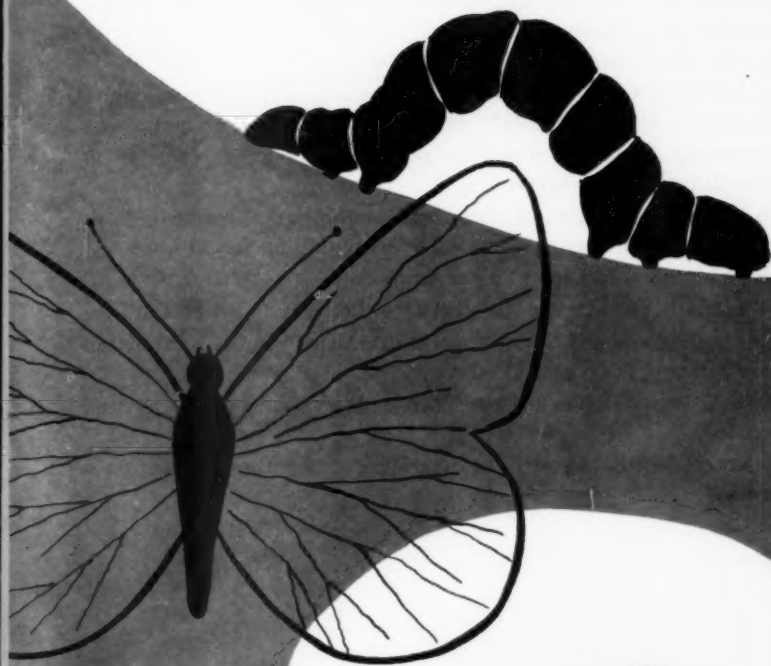


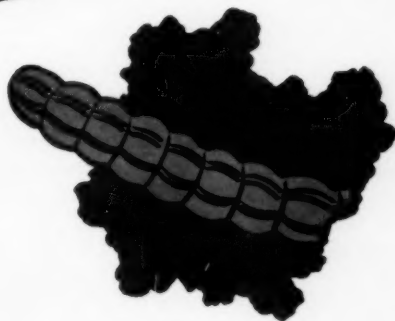
Common Insects of Vegetables

by Arthur A. Muka



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of Agriculture**



Explanation of Terms

Abdomen—the third or posterior region of an adult insect body.

Adult—last or mature stage of an insect.

Antennae—sensory organs on the head, commonly called feelers or horns.

Cocoon—a silky or fibrous covering constructed by some larvae as a protection to the pupa.

Head—the head of an insect located at the front end of the body, bearing the mouthparts and antennae.

Instar—the stage between molts in the larva.

Larva—immature stage of an insect which undergoes complete metamorphosis—egg, larvae, pupa, adult; example, caterpillar or maggot.

Metamorphosis—the series of changes through which an insect passes in its growth from egg to adult.

Nymph—immature stage of an insect that has incomplete metamorphosis—egg, nymph, adult; example, grasshopper, aphid or squash bug.

Prolegs—abdominal legs found on caterpillars.

Pupa—the resting or inactive stage between the larva and the adult.

Puparium—the hardened larval skin within which the pupa is formed in certain flies.

Thorax—the second region of an adult insect body bearing the wings and legs.

Vector—insect which carries disease producing organisms to plants or animals.

The illustrations contained in this publication are not actual size. For the sake of identifying characteristics most of the insects are shown enlarged. Consult the text for actual sizes.

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Common Insects of Vegetables

Arthur A. Muka

There are more than 60 species of insects that cause significant damage to vegetables grown in New York State. Good yields of first quality vegetables cannot be grown consistently unless the insects that threaten them are controlled. This is as true of vegetables grown in home gardens as it is of those grown in large commercial plantings.

Efficient insect control depends on the correct identification of the pest and a knowledge of its habits and life history. This bulletin contains information that should enable the grower to identify and understand the common vegetable insect pests. The life history information contained here is subject to only slight changes from year to year. Seasonal conditions may vary the time some of the insects appear but these variations are slight. An attempt has been made to picture most of the insects and their damaging stages. If more detailed information is required the reader is advised to consult text books in entomology.

Control measures have been purposely omitted because of the frequency of change. Control recommendations will be prepared each year to incorporate changes and new materials. For specific up-to-date dust and spray recommendations for vegetable insect control see *Cornell Vegetable Production Recommendations for New York* published each spring.

ASPARAGUS

Common asparagus beetle
Crioceris asparagi (L)

Twelve-spotted asparagus beetle
Crioceris duodecimpunctata (L)

Two species of beetles attack asparagus in New York State. The *common asparagus beetle* adult is about one-fourth inch long. The head, legs, and antennae are bluish

black, frequently tinged with green. The thorax is reddish to orange, with two black spots near the center. The wing covers have black bands and spots on an orange and white background. The *twelve-spotted asparagus beetle* is reddish-orange, with six black spots on each wing cover.

Damage

Shoots are curved, irregular and of low market value as a result of

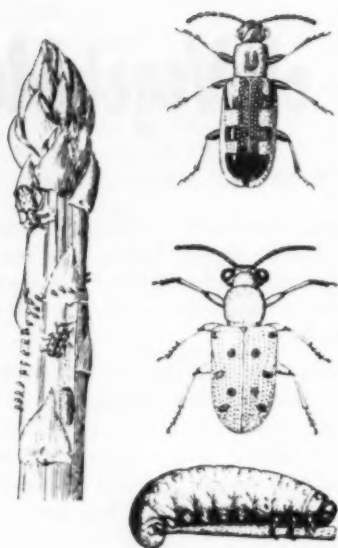


Figure 1. Asparagus Beetle. Left: egg, larva, and beetles on an asparagus tip. Right: two species of asparagus beetles and a larva.

the insects' feeding on them. Later in the season the larvae feed extensively on the foliage. This results in

weak shoots and low yields the following spring. The presence of eggs in and on asparagus spears also is a problem, especially to the farmer growing a crop for processing.

Life History

Both of these beetles overwinter in the adult stage, coming out in the spring to feed on the tender shoots of asparagus. The common asparagus beetles lay their eggs on end in rows on the shoots and foliage. The eggs of the twelve-spotted asparagus beetle are similar to those of the other species except that they are laid on their side. The dark gray larvae of both species are similar in appearance and feed extensively upon the foliage before the fruits develop. The larvae go to the ground to form yellowish pupae in the soil. Cold weather kills the eggs and larva and drives the adults into hibernation. In New York there are two to three generations each season, depending upon locality.

BEANS

Snap beans, field dry beans, and lima beans are attacked by the seed corn maggot as the seeds sprout in the ground. The growing plants may be injured by flea beetles, the Mexican bean beetle, the potato leafhopper, aphids and mites. When bean seed is stored at room temperatures it is likely to be destroyed by the bean weevil.

The degree of injury caused by one or more of these pests varies each year, depending on the kind of beans grown and on the area in which they are grown.

Seed Corn Maggot

Hylemya ciliocrura (Rond.)

The flies of the seed corn maggot are similar to those of the cabbage

root maggot. The fly is grey in color and slightly smaller but with longer legs than the house fly. The maggot, the injurious stage is one-third inch long when full grown and is white, soft-bodied and legless. It is usually found in the seed in the ground.

Damage

The seed corn maggot attacks corn, beans, peas, spinach, beets, radishes, and cruciferous crops.

Life History

The maggot overwinters in a puparium in the soil. The adult fly emerges in the spring and seeks damp soil, preferably with organic matter, to lay eggs. A freshly plowed field is especially attractive. This insect is likely to be troublesome in wet spring seasons.

The small white eggs are laid just beneath the soil surface in decaying vegetable matter, near recently planted seeds, or around newly set plants. In some seasons this egg-laying period may extend over a considerable time for the first-brood adults. In four to eight days the eggs hatch and the maggots make their way to the unsprouted or sprouting bean seeds. The young maggots feed upon the cotyledons and bud or upon the underground stem and roots of the small seedling. The maggot becomes full grown in about three weeks; it is one-fourth inch long, legless, and sharply pointed at the head with two black hooks for feeding. The skin of the maggot darkens and

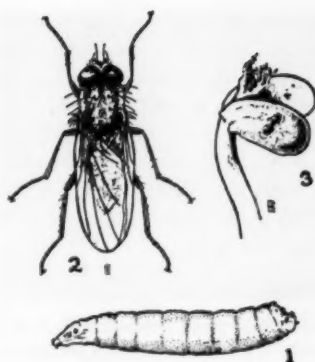


Figure 2. Three stages of the seed corn maggot: (1) maggot stage that attacks sprouting beans; (2) adult or fly stage; (3) injured sprouting bean.

hardens to form the puparium. In the ensuing 12- to 18-day period, changes take place within this puparium to produce an adult fly. The second brood of flies appears the last of June and during July. A third brood may appear in August and September. Usually it is the first brood of maggots that is most destructive to beans.

Mexican Bean Beetle *Epilachna varivestis* Muls.

The Mexican bean beetle reached New York about 1927 and is now widely distributed. It is the most serious pest of beans.

This insect is a member of the ladybird beetle family. Most ladybird beetles are extremely beneficial to man for they prey upon other insects. Mexican bean beetles are about one-fourth inch in length,

and convex in form; each wing cover has eight black dots in three rows across the body. Overwintered adults are copper colored; new adults are yellow. The larva is yellow, with long, black-tipped spines. The eggs are orange in color and laid in a cluster on the underside of the leaves.

Damage

The Mexican bean beetle is primarily a pest of beans. The adults and larvae feed almost exclusively on the undersides of the foliage. The leaves are often skeletonized to

a lace-like appearance not easily confused with other insect injury. Yields from damaged plants are reduced.

Life History

Adult beetles overwinter in trash of the ground cover, along hedge-rows, and the like. They appear on beans in June and soon begin to lay clusters of 20 to 50 eggs on the lower surface of the leaves. In 10 to 14 days the eggs hatch into yellowish grubs. When full grown, the larvae or grubs are one-third inch in length. Pupation takes place on the bean leaves. The pupa is orange in color and is attached to the leaf by means of the old larval skin. All life stages of this insect can be found on the leaves at the same time.

There are two generations a season. The total period of development from egg to adult averages 33 days in mid-summer. The periods of extensive feeding are in July and late August. Weather appears to influence this insect greatly. Heavy infestations are usually associated with somewhat cool, moist conditions. Hot, dry weather seems to discourage the development of this pest.

Potato leafhopper *Empoasca fabae* (Harr.) and other leafhopper species

The potato leafhopper is one of the most common of the leafhoppers attacking beans. Leafhoppers

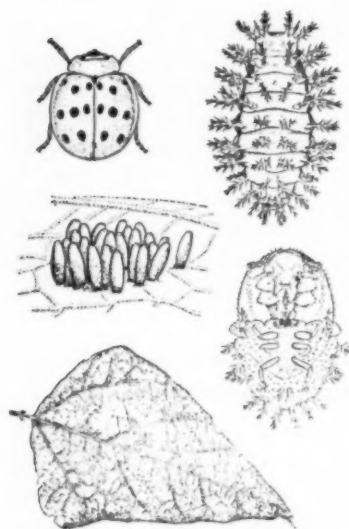


Figure 3. Stages of the Mexican bean beetle and injury to the foliage. Top: left, beetle; right, spiny grub, or larva. Center: left, mass of eggs; right, pupa, partly within the larval skin. Bottom: typical injury to a bean leaf caused by the beetle and its grub.

are tiny wedge-shaped, green insects about one-eighth inch long. The wingless immature forms are very active and scurry about on the lower surface of the leaf when disturbed while the adults fly away in swarms. Other leafhoppers are similar in shape and size.

Damage

Leafhoppers suck plant juices as they feed on the lower surface of the leaves. The bean leaves cup downward, become stunted and dwarfed. Injury first appears at the tips and margins of leaves of affected plants. This injury is called "hopper burn."

Life History

The eggs are laid in the leaf veins and stems. These eggs hatch in about ten days and the nymphs become full grown in about two weeks. There are two generations annually in New York.

Bean Weevil

Acanthoscelides obtectus (Say)

The bean weevil is a small robust yellowish-brown beetle about one-eighth inch long. The robust legless larva or grub is white.

Damage

Garden grown beans are often infested and destroyed by this weevil. The adult weevils may lay eggs in or on the bean pods in the field or garden. The more important damage is done when stored beans become infested.



Figure 4. Common bean weevil adults on damaged bean.

Life History

The adult weevils lay their eggs on the beans and pods. An infestation often begins when eggs are laid in split pods of dry beans just before harvest. The eggs hatch into legless grubs that eat their way into the beans and remain there to develop into pupae and adults. When the mildly infested beans are harvested and stored at moderate temperatures, the infestation builds up and in a few months the entire stored crop may be seriously damaged. Each larva makes a separate chamber and a single bean may contain many chambers. Many larvae may infest one bean seed and all may mature. Under warm storage conditions six to eight generations may develop in a year.

Two-spotted Spider Mite

Tetranychus telarius (L.)

Mites are tiny spider-like animals with sucking mouthparts. The two-

spotted spider mite is greenish-yellow and just visible to the naked eye. In recent years it has become occasionally troublesome on Long Island and in western New York.

Damage

In addition to beans, the two-spotted spider mite also attacks cucumbers, melons and corn. The mites suck on the under surface of the leaves and especially on the pods of lima beans. Severe feeding causes a bronzing of the pods and results in produce of low market quality.

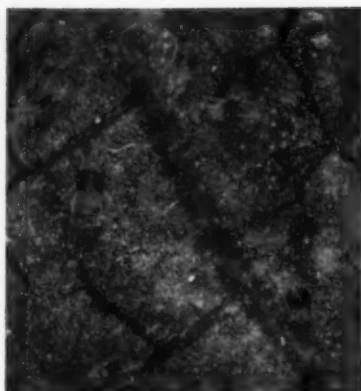


Figure 5. Two-spotted mites on the underside of a bean leaf.

OTHER PESTS OF BEANS

Aphids

At times several species of aphids may appear on bean foliage in numbers sufficient to cause injury. The two species, bean aphid, *Aphis fabae* Scop., and melon aphid, *Aphis gossypii* Glov., are the most common aphids infesting beans in New York State. The bean aphid is the black species that is found on lima beans. The latter species may be present on small plants.

The sucking of the aphids tends to weaken the plants.

Wireworms

The Eastern field wireworm, *Limonijs agonus* (Say), occasionally may attack bean seeds. The adults are brown "click beetles."



Figure 6. Eastern field wireworm on injured lima bean seed.

Green Cloverworm *Plathypena scabra* (F.)

The green cloverworm is primarily a pest on clover but sometimes does considerable damage to beans in certain locations or sections of a field. They may be found also on soybeans, cowpeas, strawberries, raspberries, and many weeds.



Figure 7. Green cloverworm larva on injured bean pod.

The larva has the looping habit and at one stage of development looks much like the cabbage looper. In next to the last larval stage it is nearly one inch in length, pale green in color, and striped lengthwise with fine white or cream-colored lines. The cloverworm larva has four pairs of prolegs (figure 7); the cabbage looper has only three pairs of prolegs. About 25 days after hatching the worms construct cocoons between leaves that they have webbed together with silk. From the dark brown pupae moths emerge to lay eggs for another brood. There are two broods each growing season. The green cloverworm overwinters in the pupal or adult stage.

Flea Beetles

Several kinds of beetles sometimes feed upon and seriously damage bean seedlings. Among these is the pale-striped flea beetle, *Systema blanda* Melsh. A related insect known as the bean leaf beetle, *Cerotoma trifurcata* (Forst.), is also troublesome at times.

These insects pass the winter in their adult stages under trash in the fields and along hedgerows. They lay eggs in the soil at the bases of plants. The larva feed upon the roots of the plants.

CRUCIFEROUS CROPS

Broccoli, Brussels Sprouts, Cabbage, Cauliflower, Kohlrabi, Radish, Turnip

Cabbage and crops related to it are subject to injury by a number of pest insects. All parts of these plants are attacked by one or more insects.

Cabbage Root Maggot *Hylemya brassicae* (Bouche)

The cabbage root maggot is probably the most serious pest of plants in the family, Cruciferae. The plants are not all subject to the same degree of injury however. Cabbage, cauliflower, radish and turnip are the most severely attacked.

The adult fly, closely related to the seed corn maggot, is grey and long legged. The larva or maggot is the destructive stage and is white and legless. It is tapered toward the head and has a pair of strong black hooks that curve downward. When full grown the maggot is one-third inch in length. The pupal stage



Figure 8. Larvae and pupae of cabbage maggot on young cabbage plant.

looks much like a grain of wheat, is tan or reddish in color and is located in the soil near the plant root.

Damage

In every region of New York where crucifers are grown, the cabbage maggot causes serious damage to plants set early and to plants germinating from seeds sown in the field. The insect is most severe on early plants growing in sandy soils. The small, whitish maggot tunnels in and feeds upon the roots of cabbage, cauliflower, turnip, radish, and related crops.

Life History

Tiny cylindrical, white eggs are laid by the adult fly. The flies usually emerge from the soil from the middle of April to the middle of May in upstate New York. In the southern Hudson Valley and on Long Island, emergence may be from ten days to two weeks earlier. Unless plants or seeds are protected from this pest, it is extremely difficult to grow plants in the field early in the season.

Adult flies emerge from the puparia in the soil at about the time the first plants are set in the field or a little earlier. The female may tuck the eggs down between the plant stem and the soil. Eggs also are laid in a recently planted field

so that the germinating seed is attacked before emergence. This occurs most frequently when seeds are sown too deep, or when cold wet weather delays the plants' coming through the soil. The eggs hatch in four to ten days, depending upon the weather. Maggots become full grown in about three weeks. The larva forms a puparium in the soil near the plant. Within 12 to 18 days the adult flies emerge from the puparia. A second brood of flies appears at the end of June or the beginning of July. A third brood may appear later. Usually it is only the first brood of maggots that growers have to battle in upstate New York. Long Island has trouble over a longer period.

Striped Flea Beetle *Phyllotreta striolata* (Fab.) and other flea beetles

A number of flea beetles feed upon crucifers. The striped cabbage flea beetle and the cabbage flea beetle are frequently found on plants in the seedbed and on plants set in the field. These small, usually dark colored leaf beetles have enlarged hind femora (thighs) for jumping. When approached they suddenly spring into the air for a distance of a foot or more to escape their enemies. They can fly also, but were named flea beetles for their jumping habit. The full-grown white larvae are about one-third inch long and have brown or blackish heads.



Figure 9. Cabbage flea beetles on cabbage leaf.

Damage

As soon as the plants come through the soil or are transplanted in the field, the overwintering adult flea beetles are present and begin feeding upon the foliage.

Life History

Most flea beetles in New York State overwinter in the adult stage in sheltered places such as fence rows and under rubbish. They come out of hibernation early in the spring to feed upon weeds or plants growing in the field. Usually the small white eggs are deposited in the soil around the plants; these hatch into small, white, elongated larvae that feed upon the roots. Pupation takes place in a small earthen cell. The summer brood of adults appears at the end of July or during August. These beetles do much damage late in the summer then locate overwintering quarters; they are responsible for injury to crucifers the following spring.

Cabbage Worms

A number of green worms appear on cabbage and related crops. The

two that are most common and of greatest economic importance in New York State are the imported cabbage worm and the cabbage looper. The larva of the diamond-back moth is not a serious problem but can usually be found in small numbers each year.

Imported Cabbageworm *Pieris rapae* (L.)

In early spring it is common to see many white butterflies flying in grain fields as well as in vegetable areas; these are the adults of the imported cabbage worm. The butterfly has whitish-yellow wings about one and three-fourths inches wide when expanded. There are usually three or four black spots on the wings. The bullet-shaped, ridged eggs are about one-twenty-fifth of an inch long, are laid singly and attached to the leaves. The newly hatched larvae are pale green. As they mature, they become a velvety green with a faint golden line down the back and an interrupted white line on each side. Mature larvae are one inch long.

Damage

The worms of this insect feed on all plants of the cabbage or mustard group, including cabbage, cauliflower, kale, collards, kohlrabi, Brussels sprouts, mustard, radish, turnips, horse-radish, and on related weeds. They also will attack lettuce, nasturtium, sweet alyssum and other flowers. The caterpillars eat large

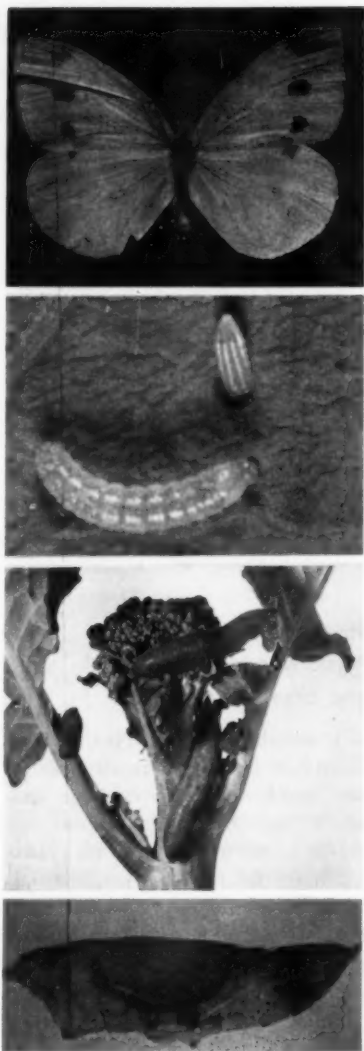


Figure 10. Imported cabbage worm, top to bottom: adult butterfly egg and recently hatched larva; cabbage worms on head of broccoli; pupa.

irregular holes in the leaves. They also eat holes in the heads of cabbage and leave excrement stains on the edible portions of the plants.

Life History

The butterflies lay small, finger-like eggs singly on the underside of the leaves. The eggs hatch in about a week and the young larvae begin to feed in the immediate area. The worms attain maturity in ten days to two weeks and transform into a chrysalis or pupa on the underside of a leaf or in some sheltered place. The pupal stage lasts from 10 to 12 days in the summer; this is the overwintering stage. A white butterfly emerges from the chrysalis. There are three or four generations each season.

Natural enemies of this insect are present in the cabbage growing areas; a small braconid wasp lays its eggs inside the body of the caterpillar, and its young, feeding internally, devour the worm so that it dies. The larvae of the wasp eat their way out of the caterpillar and pupate in masses of small yellowish or white cocoons on the leaves.



Figure 11. Braconid wasp (adults and cocoons) on cabbage leaf with imported cabbage worms.

A few recently emerged black adult wasps can be seen in figure 11.

Cabbage Looper

Trichoplusia ni (Hbn.)

The cabbage looper is present in all vegetable areas of New York State. It is not usually noticed early in the season, but may be abundant in the summer and fall. The pest is capable of great destruction and can be the most destructive worm feeding on cabbage and related crops.

The full-grown cabbage looper caterpillar is about one and one-fourth inches long. The insect is pale green in color and is marked with two dorsal stripes and a white stripe on each side of the body. It crawls with a peculiar looping motion like a measuring worm. It has only three pairs of abdominal prolegs, compared to five pairs for the imported cabbage worm and diamond-back caterpillar. The adult is a greyish-brown moth with a silvery spot on each front wing. It is nocturnal in habit and rarely seen.

Damage

The looper feeds on the leaves and bores into the heads much as does the imported cabbage worm. Because it is somewhat larger and feeds for a longer period, the injury it inflicts is often more severe. This insect attacks all plants of the cabbage, or mustard, family as well as many other plants such as lettuce, spinach, pea, celery, parsley, potato and tomato.

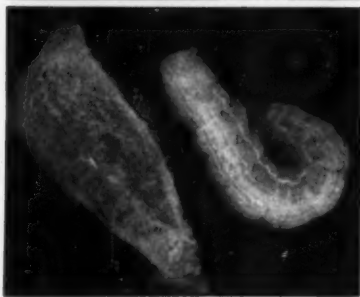
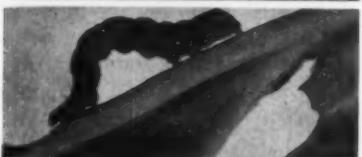


Figure 12. Cabbage looper, top to bottom: adult moth; egg and recently hatched larva; larva on cabbage leaf; larva and pupa in cocoon.



Figure 13. Light-colored cabbage looper worm (with virus disease) holding to a healthy worm.

Life History

The insects overwinter as pupae. The nocturnal moths lay small, greenish-white spherical eggs singly on the leaf surface of the host plants. The eggs hatch in four or five days and the loopers mature in two to three weeks. There are usually three generations a season in upstate New York.

A virus disease attacks the looper in nature. The control afforded by disease outbreaks varies but may be quite effective in some seasons.

Cabbage Aphid *Brevicoryne brassicae* (L.)

The cabbage aphid is usually most abundant and destructive in seasons of drought when its feeding, combined with unfavorable cabbage-growing conditions, often stunts or even ruins a crop. The insect is covered with a powder that gives it a greyish-white appearance.

Damage

The cabbage aphid is a problem wherever crucifers are grown in



Figure 14. Cabbage aphids on broccoli.

New York. It also lives on wild plants of the mustard family. Aphids suck the juice from plants and cause them to become stunted and yellow from loss of vigor. This insect may be present all season, but is most troublesome in the late summer and the fall. The presence of aphids contaminating the marketable parts of crops may cause entire shipments to be rejected.

Life History

Overwintering this far north takes place in the egg stage. The cabbage aphids lay elongated, oval,

shiny, black eggs on the leaves and stems of plants left in the field. Frequently they lay eggs on perennial hosts just outside of fields where crucifers are grown. Wingless females hatch from the overwintering eggs; each stem mother gives birth to 40 or 50 young females. After several generations are produced, they fly to fields of crucifers where they give birth to wingless females and establish colonies. As many as sixteen generations have been known to develop from April 1 to October 1 in New York State. Anytime during the season, winged females may be produced if the food supply becomes short or the aphid population is heavy. In the fall, winged males and females are born. The winged females give birth to true wingless females that mate with the winged males and lay the eggs that overwinter.

A number of natural enemies of this insect such as syrphid fly larvae, ladybird beetles and aphid lions help to reduce aphid infestations.



Figure 15. Syrphid fly larva among cabbage aphids.

OTHER PESTS OF CRUCIFEROUS CROPS

Thrips

The onion thrips, *Thrips tabaci* (Lind.), may be present on cabbage at almost any time during the growing season. These insects are found in heads of cabbage on the market. They puncture the epidermis of the leaves and stems, sucking up the exuding sap. This gives the plant the appearance of being marked with numerous tiny dashes that may join as whitish blotches.

Wireworms

Wireworms present in fields where crucifers are to be grown will often feed on the crucifer root system.



Figure 16. Wireworms on roots of young cabbage plant.

CARROTS

Carrot Weevil

Listronotus oregonensis (Lec.)

In Orange County and on Long Island, carrots, parsley and celery are attacked by the carrot weevil. The adult beetle is dark brown and has a snout. The legless grubs are white.

Damage

The larvae or grubs of this insect burrow into the roots of carrots and parsley and into the hearts of celery. Injury may not be serious some years, but crops are totally destroyed in other years.

Life History

The adult weevils overwinter in plant refuse and sod, especially

along ditch banks in the immediate vicinity of the infested area. In the first part of May they come out of hibernation, feed for a short time,



Figure 17. Carrot weevil larvae on carrot.



Figure 18. Carrot weevil adult.

and begin to lay eggs. The female hollows out a cavity in a leaf stalk in which she deposits three or four eggs, sealing the opening with a blackish substance. The eggs hatch in about ten days. The young larvae begin feeding on the inside of the stalks; usually they tunnel downward to the root without coming to the surface. The cavities made by the carrot weevil larvae contain frass while those of the carrot rust fly do not.

The larvae become mature after two weeks of feeding, leave the root, and pupate in pupal cells at a depth of two to three inches. These first-brood adults appear in July and lay eggs for a second brood of larvae that injure carrots in August. A partial third brood may develop late in the season.

Carrot Rust Fly *Psila rosae* (F.)

For many years the carrot rust

fly has been the most serious enemy of carrots in New York. It also attacks celery, parsnips, parsley, and wild carrots. The adult fly has a shining dark-green body, a yellowish head with red eyes, and pale yellowish legs.

Damage

The first-brood maggots feeding on the tips of the main roots give carrots a branched appearance. The second- and third-brood larvae tunnel in the carrots. The larvae or maggots that cause all the injury are white, legless and pointed at the front.

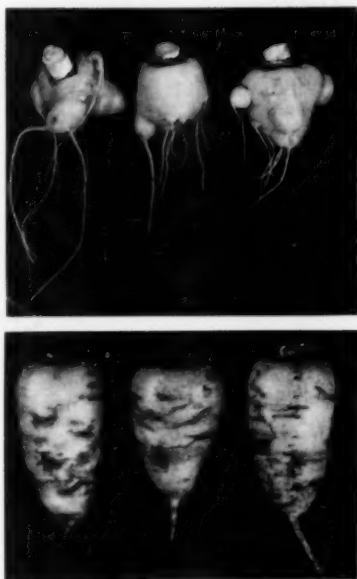


Figure 19. Carrot rust fly injury from first brood (top) and second brood (bottom). Photos by W. A. Rawlins

Life History

The carrot rust fly passes the winter in a puparium in the soil. The adult flies emerge in the spring and appear in carrot fields during May. They lay small, white, oblong eggs in the soil around the carrot plants. The eggs hatch in about one week and the young maggots work their way down to the tip of the main root, at first feeding on the smaller roots. The feeding on the tips of the main roots produces growth in several directions that results in a branched appearance. The first-brood maggots mature in about one month and pupate in the soil around the carrots.

The second brood of flies emerges in July. The maggots from this generation feed on the small roots until about the first week in September. Then they begin to tunnel into the main root; this may occur from seven to ten days earlier in the lower Hudson Valley. Growers should time their plantings in order

to harvest early and therefore avoid the second brood injury. In October there may be a partial third brood.

Six-spotted Leafhopper *Macrostelus fascifrons* (Stal.)

The six-spotted leafhopper, often called the carrot leafhopper when it is present on carrots, is described more fully in the discussion of insects of lettuce on page 26.

Damage

The six-spotted leafhopper transmits the aster yellows virus disease known on carrots as carrot yellows. Bushy tops and knobby or woolly roots running the length of the carrot are signs of the disease. In addition to the misshapen low quality roots produced, an off-flavor is also reported. This leafhopper passes the winter in grain fields. It multiplies there and the adults move out into adjoining carrot fields in late July.

CELERY

Tarnished Plant Bug *Lygus lineolaris* (P. de B.)

The tarnished plant bug is a brownish bug mottled with various shades of reddish-brown and yellow-brown. The adult is about one-fifth inch in length and the nymphs that closely resemble the adult may be found in several stages with varying amounts of wing-pad development.

Damage

The tarnished plant bug may be found on many different crops. Much injury done to various crops by this pest goes unnoticed. The bugs prefer to attack the tender growing points where they insert their beaks and suck the sap. They also feed on a great variety of wild plants such as ragweed, red root, and wild carrot, and are especially

abundant in weedy fields. Since these insects are wary and move rapidly, it is easy to overlook them and attribute the injury to some unknown factor.

Most of the injury done by this insect is found on the blanched varieties of celery. The adults puncture the tender white stalks, producing large brown wilted spots and a darkening of the tissue at the joints; this injury is known as *black joint*. In early celery the nymphs and adults may feed upon the hearts and cause a darkening of the tissue.

Life History

Like other true bugs, the tarnished plant bug has three life stages—egg, nymph, and adult. Overwintering takes place in the adult stage beneath trash and ground cover in woodlots and along fence rows. The adults come out of hibernation early in the spring to feed on opening buds of many trees and shrubs. The female inserts her eggs in the tender tissue of the celery plant. In about 10 days the eggs hatch into nymphs that are



Figure 20. Adult tarnished plant bug.

yellowish-green to greenish, with four black spots on the thorax. There are five nymphal stages. The thorax and wing pads are mottled with brown in the latter stages. Wings appear in the adult stage. The time required for development from egg to adult is from 25 to 30 days. In upstate New York there are probably four generations each year.

OTHER PESTS OF CELERY

Carrot Rust Fly

The carrot rust fly may attack celery both in the seed bed and in the field if the plants are available during egg laying. The injury occurs from the maggots feeding in the small roots. The carrot rust fly is described on page 19.

Six-spotted Leafhopper

This pest, which is described under lettuce on page 26, is also a celery pest. It carries a strain of the aster yellows virus to celery causing the affected plants to yellow and the leaves to become curled and stunted.

CUCURBITS

Cucumber, Muskmelon, Squash, Pumpkin

The cucurbits are attacked by a number of insect pests. The more serious ones are those that chew holes in the leaves and defoliate the plant, suck plant juices, tunnel within the vines, or transmit two

serious plant diseases—wilt and mosaic.

Striped Cucumber Beetle *Acalymma vittata* (F.)

The striped cucumber beetle is the most serious pest of cucurbits. The adult is one-fifth inch long with a black head, yellow thorax and wing covers that form three distinct longitudinal black strips when folded.

The slender grubs are white with brown heads and are about three-eighths inch long when full grown. They feed underground and are seldom noticed.

Damage

This insect is the major pest of cucurbits in New York State. The first and greatest damage results from adults feeding on stems and seed leaves when the plants are pushing through the ground before true leaves have developed.

Later in the season when another generation of beetles appears, the leaves, blossoms and fruits of vine crops may be seriously damaged. Even greater losses are caused by the insect as a vector of bacterial wilt. The bacillus causing this disease overwinters in the intestines of the beetles.

Life History

Striped cucumber beetles hibernate under trash and leaves and in patches of woodland, often at some



Figure 21. Cucumber beetles. Top, twelve-spotted cucumber beetle; bottom, striped cucumber beetle.

distance from the field in which they breed. The beetles emerge from hibernation early in the spring and feed on the leaves and flowers of various wild plants. They congregate on cucurbit plants just as the plants are coming up. After they feed for some time, mating takes place and egg laying begins. The female lays eggs in the soil around the base of the cucurbit plants. Eggs hatch in about one week. The larvae work their way down to the underground parts and begin feeding and tunneling. It takes about a month for the worms to mature; they are three-tenths inch long and white with brown head and dark patches at neck and tail regions. Pupation takes place in the soil and lasts a week or more. During late August a new brood of adults emerges; they feed on flowers of wild plants and on the fruits and foliage of cucurbits up until the first heavy frost, then go into hibernation.

Spotted Cucumber Beetle

Diabrotica undecimpunctata
howardi, Barber

The spotted cucumber beetle is about one-fourth inch long and has a black head and black legs. Its body is yellowish-green and it has twelve distinct black spots on the wing covers. The larvae develop in the soil and feed on roots. The larvae are slender and similar in appearance to the young of the spotted cucumber beetle, but are

larger—one-half inch long when fully grown.

Damage

The injury to cucurbits, including the spread of bacterial wilt, is similar to that caused by the striped cucumber beetle, but injury caused by the spotted cucumber beetle is not so severe. This insect is a pest of cucurbits but it also attacks a wide variety of other crops including most garden vegetables. In the South where the pest is known as the southern corn rootworm, serious damage is caused to corn.

Life History

The seasonal development of this species is similar to that of the striped cucumber beetle.

Squash Bug

Anasa tristis De G.

Although the squash bug is present in all of our vegetable areas it is not a serious pest in commercial plantings. Nevertheless it is often troublesome on squash and pumpkins wherever they are grown. The adult squash bug is about five-eighths inch long and is a dirty brownish-black color on top and brown mottled with black on the bottom. The nymphs are grey, flattened and broad in proportion to their length. These bugs have the objectionable odor of stink bugs. Eggs are usually laid in groups in a symmetrical pattern on the undersides of leaves in the angles formed by the veins.

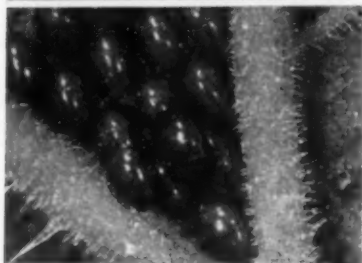


Figure 22. Squash bug adult (top), eggs (center), nymph (bottom).

Damage

The adults and their immature forms known as nymphs suck the sap from leaves causing them to wilt and die.

Life History

The adult squash bugs overwinter in dry, sheltered places and come out of hibernation in the spring. They feed upon the young plants and lay large, brown eggs in groups in a symmetrical pattern in the angle formed by the veins on the underside of the leaves. The eggs hatch in six to fifteen days. The newly emerged nymph has a greenish-grey body with scarlet legs, antennae and beak. The young molt five times to become adults. After the first molting the nymph is a very light grey, almost white, speckled with black. Four or five weeks are passed in the nymphal stage. New adults appear in August or later.

Squash Vine Borer

Melittia cucurbitae (Harr.)

The squash vine borer is a pearly white, wrinkled worm with a brown to black head. The full-grown larva is about one inch long. The adult is a beautiful clear-winged moth that flies during the day. The wings are a metallic olive-brown with a spread of one to one and one-half inches. The abdomen is orange, red, black and white. The egg is small, flattened and brownish, and is deposited on stems and leaf stalks near the base of the plant.

Damage

This insect causes widespread damage to susceptible plants. The main crops attacked are squash, pumpkin, gourd, cucumber and muskmelon. Normally the insect is not a serious pest in commercial plantings, but small plantings and home gardens are often seriously infested. The young borers penetrate the vine and burrow through the stem or runner, usually toward the base. The burrows of the larger larvae are usually wet, slimy and partly filled with excrement; decay often ensues and hastens the death of the vines. Even though vines may not be killed, infested plants will yield poorly.

Life History

The winter is spent as a larva or pupa in a silken brownish or blackish cocoon in the soil where the crop was grown. In the spring the adults emerge and fly into the fields just about the time the vines begin to run. The eggs hatch in six to fifteen days. The young worm soon enters the stem and begins burrowing. Coarse grains of yellow excrement are forced out through holes onto the ground. The mature worm leaves the stem and enters the ground to form a tough silken

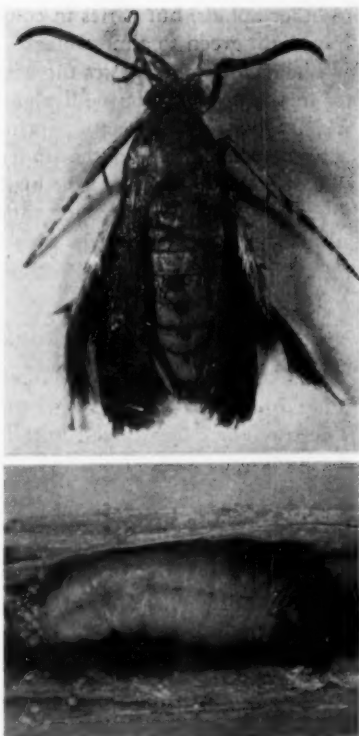


Figure 23. Squash vine borer adult (top) and larvae in squash vine (bottom).

cocoon for pupation. In upstate New York there is only one generation; in the southeastern section of Long Island, there may be a partial second brood.

OTHER PESTS OF CUCURBITS

Melon Aphid

The melon aphid, *Aphis gossypii* Glov., is the aphid species most commonly encountered on cucur-

bits. Some years this aphid may be an important pest. Melons and cucumbers are most commonly injured. This pest is similar in form

to other aphids, but varies in color from light green to almost black.

The melon aphid passes the winter in the egg stage on wild plants such as live-forever. In the spring winged forms settle on the underside of melon leaves and give birth to young. Both the young and adults suck the sap out of the plants,

causing the leaves to curl downward, turn brown, and die. This aphid transmits mosaic.

Seed Corn Maggot

The seed corn maggot will attack germinating cucurbit seeds. A detailed account of this pest is given on page 6.

EGGPLANT

Flea beetles and aphids are sometimes injurious pests of eggplant. The tiny black beetles eat holes in the leaves and the aphids suck sap

from the plant. Both types of injury weaken and reduce the vigor of the plant. The Colorado potato beetle occasionally feeds on this plant.

LETTUCE

Six-spotted Leafhopper

***Macrostelus fascifrons* (Stal.)**

The adult leafhopper is small (about one-eighth inch long), wedge-shaped, pale greenish-grey with six black spots on the forepart of the head. The wingless nymphs have sucking mouthparts, are active and move around on the undersides of leaves of the host plants.

Damage

The six-spotted leafhopper is of importance as a lettuce pest primarily because it is the principal carrier of a disease organism known as the aster yellows virus. It also transmits this virus to carrots, and celery. Because the insect is a disease vector it is of great economic importance. Several weed hosts such as

wild carrot, chicory, dandelion and wild aster also harbor the aster yellows virus. Once the leafhoppers have fed on diseased plants, they transmit the disease organism to healthy plants. All lettuce fields should be disked under immediately after harvest.

Life History

The leafhoppers pass the winter in the egg stage on winter grains and grasses. The nymphs emerge in early spring and complete their development on the grains and grasses. The adults migrate from this site to wild or cultivated plants. Several generations are produced during the summer. The last brood returns to weeds, grains and grasses for the winter.

OTHER PESTS OF LETTUCE

Several other insects will attack lettuce, but most of these are also injurious on other plants and are described on other pages of this

bulletin. Aphids may sometimes infest lettuce and may carry a mosaic virus into the planting. The cabbage looper is an occasional pest on lettuce.

ONION

Onions, a major muck crop, are grown on approximately 14,000 acres in New York State. Onions are attacked by few kinds of insects, but are seriously damaged by two—the onion maggot and onion thrips.

Onion Maggot

Hylemya antiqua (Meig.)

The adults are slender, ash-grey bristly flies about one-fourth inch long. The full-grown onion maggot is legless, pearly white and about one-third inch long. The adults, larvae and pupae resemble those of the seed-corn maggot and cabbage root maggot.

Damage

The onion maggot attacks onions throughout the growing season. Damage is most severe when the plants are small. An early infestation results in a poor stand. The destruction of onion seedlings not only reduces the stand but causes the remaining plants to be less uniform in size. If the attack comes when the plants are older, the bulbs are misshapen and decay may occur to the infested and surrounding bulbs in storage.

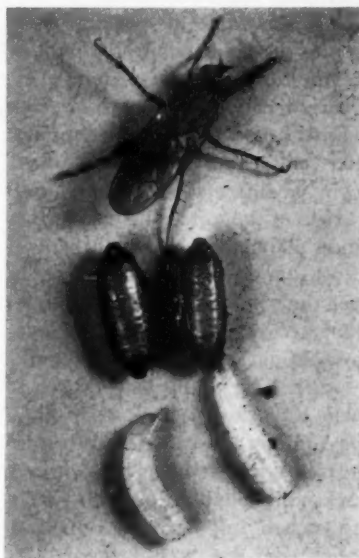


Figure 24. Onion maggot adult, pupae, and larvae (top), and larvae on small onion (bottom).

Life History

Overwintering takes place in the puparium stage in the soil of either the onion field or along the edges of the field, especially where cull onions have been discarded. Cull onions should not be dumped on fields nor should they be left in piles near the onion fields. In the spring, the adult flies emerge and fly into the fields before the onions are up. Emergence may extend over a period of a month or more for the first-brood flies. About ten days after emergence the female flies begin laying eggs in cracks and crevices of the soil at the base of the onion plants, in the base of the leaf sheath, or on the side of the stem near the ground. The small, white, elongated eggs hatch in from two to seven days, depending upon the weather. The young maggots work their way down, boring through the underground stems and into the bulbs; they feed for two or three weeks and are about one-third inch long when fully grown. Pupation occurs in the soil around the plants, and in two to three weeks second-brood adults emerge and lay eggs for another generation. There may be a partial third brood late in the season.

Onion Thrips

Thrips tabaci Lind.

The onion thrips is a slender, very small, light yellow to brown insect with four narrow wings fringed with hair. The pest is so

small it is difficult to see with the naked eye—so small that growers do not see it. The young, or nymph, is pale yellow and similar in form to the adult.

Damage

Both the adult and nymph feed by rasping the surface of the leaf with their mouthparts and feeding on the sap that flows from the wounded tissue. The injured area appears as small white or silvery blotches on the foliage. Heavily infested plants become stunted, whitish, wilt and fall over. Adults and nymphs are found in greatest numbers hidden under the sheath at the base of the leaves and between the young leaves at the center of the plant. This pest often is a serious threat to muck grown onion crops in New York. Injury is most severe, however, during hot, dry seasons.

Onions grown from seed are more severely injured by the thrips than are those grown from sets, but the latter, when heavily infested, serve as a reservoir from which the insects spread to seed onions.

In addition to onions, thrips feed on beans, cabbage, cucurbits, corn, a large number of other field and garden crops, and weeds.

Life History

Overwintering takes place in both the adult and nymphal stages on onion plants left in the field and in the culls and rubbish left around the borders of the onion fields. The adult female thrips are about one twenty-fifth inch in length; they

insert white, translucent, bean-shaped eggs into the tissue of the leaves. The eggs hatch into nymphs in five to ten days. The nymphs pass through two stages while feeding upon the plant; this takes about ten days. Then they enter the soil

to pass through two more immature stages before becoming adults. Little or no food is taken during the last two nymphal stages in the soil. The life cycle is completed in about 26 days. There are five or six generations annually.

PEA

Pea Aphid

Macrosiphum pisi (Harr.)

The pea aphid is an important insect in New York State and is extremely destructive in some seasons. This aphid is large when compared to some other species of aphids. It is light green in color and blends with the color of the plant host. The winged females are from one-eighth to three-sixteenths inch in length. The antennae are somewhat longer than the body.

Damage

The pea aphid attacks peas, sweet peas, alfalfa, clover, vetch, sweet clover and weeds of the legume family. On peas the aphids not only feed upon the leaves, flower spikes, and pods but carry mosaic disease that may greatly reduce yields or possibly prevent the setting of a crop. Enation mosaic, streak, and stunt are virus diseases commonly carried by the pea aphid.

Life History

In upstate New York the pea aphid may pass the winter in the egg stage on clover, alfalfa, or vetch. On Long Island and in other southern locations, the adult may overwinter on the above crops. The first generation of adults is confined to the winter host plants. Winged adults are born and often fly into the pea fields just about the time the peas come through the soil.

Infestations can build up in a short time. Winged forms give birth to wingless aphids. Peas can be infected with one of the viruses, by a few aphids in a short time.



Figure 25. Adult winged pea aphid.

Pea Weevil

Bruchus pisorum Linn.

The pea weevil is present in New York State most seasons. Because the processing industry cannot tolerate any weevils in peas, a constant vigil and control program is necessary for pea production to continue.

The adult is a small snout beetle about one-fifth inch long, similar to but larger than the bean weevil. It is brownish in color with black, white and dark brown mottling on its back. Like the bean weevil, the wing covers of the pea weevil are short and do not extend to the tip of the abdomen. The exposed part of the abdomen is white, with two large black spots at the tip. The grubs are white and legless.

Damage

The larvae or grubs feed inside the peas. It is difficult or impossible to separate infested pods; therefore the processor may reject an entire crop for this reason.

Life History

The weevils overwinter in the adult stage under trash around



Figure 26. Adult pea weevil on pea pod. Eggs are indicated at arrows.

fields, along fence rows, and in other nearby locations where peas were grown.

When the peas begin to blossom, the adult weevils migrate into the fields to feed and lay eggs on the outside surface of the newly formed pods. In 10 to 12 days the eggs hatch. The larva bores into the pod immediately and enters a pea where it feeds and pupates. The holes through which the larva enter the pod and pea are soon healed over and only small brownish dots remain. Only the worm stage is found in peas harvested for processing. Adults emerge from the peas left in the field in August.

PEPPER

This crop may be attacked by a number of insects, most of which are not specific to peppers alone. The pepper maggot, European corn borer and aphids all may cause damage in pepper plantings from year to year.

Pepper Maggot

Zonosemata electa (Say)

The adult fly is somewhat larger than the housefly; it is light yellow in color and has a smoky black pattern on its wings. The larvae are typical maggots, pointed at the head.

Damage

This insect is a serious pest of peppers grown in the Albany area, parts of the Hudson Valley and on Long Island. The feeding of the growing maggot within the pulp and among the seeds renders infested peppers unmarketable.

Life History

The adult fly emerges when the pepper fruits are small; this may be the first part of July in the Albany area. They are active early

and late in the day.

When the older fruits are about one-third grown, the female fly inserts an egg through the fleshy wall of the pepper and fastens it singly to the inside surface. A small black scar or dimple results from an egg-laying puncture. Maggots hatch from the eggs and tunnel through the flesh of the fruit. When mature, the maggot makes a hole through the wall of the fruit and escapes to the soil for pupation. There is only one generation each season.

OTHER PESTS OF PEPPER

European Corn Borer

The corn borer may attack the stem and pods of pepper. Activity of the larva within the pepper allows growth of decay organisms and causes rotten unmarketable fruits.

Aphids

Aphids may appear in injurious numbers during dry, warm periods. They suck plant juices from the lower surface of the leaves and cause the plants to wilt. Heavy infestations may cause plants to die.

RHUBARB

Rhubarb curculio

***Lixus concavus* Say.**

The rhubarb curculio is not a great problem, although it occasionally marks rhubarb stems. It is most likely to be found in home gardens.

The adult is a large grey-black snout beetle about one-half inch long, covered with a rusty powder.

Damage

The adult eats a hole in the rhubarb stem with its mouthparts and lays an egg in the puncture. The larva rarely develops in the acid stem; therefore exuding scars are

the only injury. The insect attacks curled dock and completes its life cycle in this host. It also may attack thistle and sunflower.

Life History

The insect overwinters as an adult and lays eggs in curled dock and rhubarb stems in June and July. The larvae that hatch in rhubarb soon die, but those in dock bore down the stem as they develop and finally pupate near the ground. Adults emerge in September and find a protected location in which to hibernate for the winter.

SPINACH, BEETS, CHARD

Spinach Leaf Miner

Pegomya hyoscyami (Panz.)

The leaves of spinach, beets and chard are subject to infestation by the spinach leaf miner. It is the most serious threat to spinach crops, and to beets grown for greens. The adult is a fly and the stages are similar in appearance to the seed corn maggot (see figure 2).

Damage

The leaf miner larva attacks the leaves of spinach, beets and chard by mining in the tissues between the two outer surfaces. This causes irregular blotches or blisters in the leaf. Several maggots are usually found in the same leaf, and often the blotches coalesce. The pest is especially troublesome on Long Island and may be found in the vegetable areas of central and western New York. It may appear on fall-grown spinach as well as that grown in the spring.

Life History

The flies emerge from the overwintering puparia and appear in the fields in April or May, depending upon location and season. The female deposits small elongated white eggs singly or in groups, side by side, on the underside of the leaves. The eggs hatch in four to six days, and the young maggots work their way into the tissue of the leaf where they eat out a mine between the upper and lower leaf

surfaces. The larva becomes mature in one to two weeks, leaves the leaf, enters the soil, and transforms to a puparium. Adult flies emerge two to three weeks later. In central New York there are three generations and sometimes part of a fourth each season.

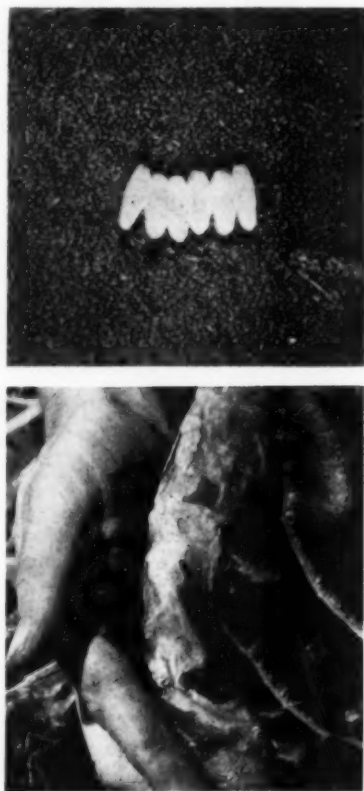


Figure 27. Spinach leaf miner eggs on leaf (top), and injury to chard leaf (bottom).

Green Peach Aphid *Myzus persicae* (Sulz.)

The green peach aphid may be a problem either on spring or fall grown spinach. This pest flies sporadically into the spinach fields from weeds and other crops. It may appear in great numbers just before harvest in the fall, and the infested spinach may be refused by the buy-

er. This species of aphid feeds on a wide variety of vegetable crops and weeds.

Life History

The green peach aphid overwinters in the egg stage on peach, plum or cherry trees. The eggs hatch in the spring, and several generations develop on the overwintering host before they migrate to vegetable crops.

SWEET CORN

Insect pests of sweet corn in New York include a flea beetle that transmits a bacterial wilt disease known as Stewart's disease, the European corn borer, the corn earworm, the fall armyworm, corn leaf aphid, the corn sap beetle and the seed corn maggot. One or more of these pests requires control measures each year in some parts of the State.

Corn Flea Beetle *Chaetocnema pulicaria* Melsh.

The adult is a small black flea beetle one-sixteenth inch in length. When the insect is abundant on young sweet corn Stewart's disease, which it transmits, may reduce the crop materially, especially of early varieties. Two other insects, the toothed flea beetle, *Chaetocnema denticulata* (Ill.), and the spotted cucumber beetle also may carry the wilt organism from plant to plant. The corn flea beetle, however, is the chief vector involved in the spread of Stewart's disease.

Life History

The adult overwinters in the soil, grass, and rubbish around the edges of fields and along fence rows. The abundance of these beetles is dependent upon the severity of the winter. Following mild winters many flea beetles are likely to be present to infect the young corn plants with Stewart's disease. The disease organism overwinters in the

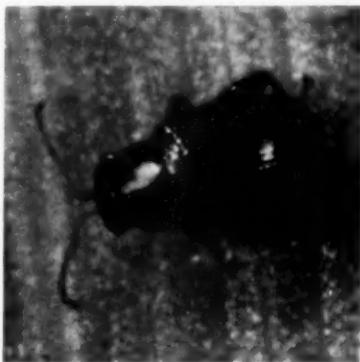


Figure 28. Corn flea beetle on corn leaf.

bodies of the adult beetles and is transmitted in the feeding activity. A new generation of beetles emerges in summer and may transmit the organisms in later plantings. The characteristic feeding marks are short, narrow grooves (pin stripes from one-fourth to one-half inch in length) cut in the green tissue parallel to the veins.

European Corn Borer *Pyrausta nubilalis* (Hbn.)

The European corn borer is a serious pest of corn and many other crops. The adult female is a yellowish-brown moth with wavy dark lines across the wings. The male is slightly smaller and darker in color. The moths have a wingspan of about one inch. The larva or borer is dirty-white and about one inch long when fully grown.

Damage

Corn is the main host plant but many other plants may be attacked. A few of the more common hosts are pepper, potato, sorghum, barley, beans, dahlia, aster, hollyhock, pigweed, lamb's quarters and fox-tail. The larvae bore into all parts of the cornstalk and ear, interrupting normal plant growth, weakening the stem and reducing yields. Early-maturing varieties are preferred by the borers. Early market ears containing borers cause losses for growers.

The European corn borer is a pest in nearly all sweet corn areas

of New York State. In the Hudson Valley, on Long Island, around Syracuse, and in some parts of western New York, borer injury to the ear is likely, especially where fresh market corn is grown. The first visible damage usually is tiny etched patches and pinholes in the leaves. The tiny borers usually infest the emerging tassel and may cause it to break over.

Life History

The borer larvae overwinter in cornstalks and other suitable nearby plants. In the spring, the worms pupate in their overwintering quarters and the moths emerge from 12 to 14 days later; in the lower Hudson Valley this is the latter part of May. These moths lay flattened eggs in overlapping scale-like masses on the undersides of the leaves. Most invasion of the plant takes place in the whorl stage, a week or more before the tassel appears.

First-brood worm activity is at a peak in June in Ulster County and Long Island; in these sections of the State, as well as a few parts of central and western New York, there are two broods. The second-brood worms are particularly troublesome in the ears during August in the lower Hudson Valley and August and September in the Long Island sweet-corn areas; these are the larvae that overwinter as mature worms.

Some areas have only one generation; this is true for most of upstate New York. In many locations protection is needed to prevent injury to the ears.

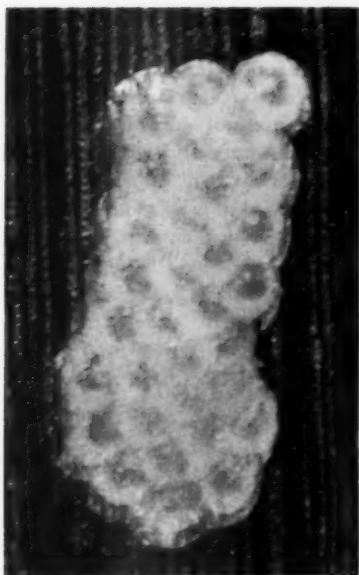


Figure 29. European corn borer egg mass (left), and larva near entrance hole in corn stalk (right).

Corn Earworm

Heliothis zea (Boddie)

In other areas of the United States where the corn earworm is a pest of cotton and tomato, it is also known as the bollworm and tomato fruitworm. The pest is capable of causing serious injury to corn and is often the most important corn insect in New York. Greater difficulty and damage occur in the Hudson Valley and on Long Island than upstate.

The adult is a yellowish-brown moth with a wingspan of one and one-half inches. The moth belongs to the same family as the armyworm moth, which it resembles. The larva

of the earworm varies in color from light green to brown or black with conspicuous light stripes along the side of the body. The full-grown earworm is one and one-half inches long. The whitish eggs, about one half the size of a pinhead, are ribbed and shaped like a flattened ball.

Damage

The corn earworm is a general feeder, but most often attacks sweet corn and field corn in this State. Tomatoes also may be a host in years of heavy infestation. Other hosts include green beans, lima beans, cabbage, peppers and squash.

Foliage and tassels are damaged, but feeding on the tips of the ears is the most serious injury done to corn. The mere presence of earworms and their abundant, unsightly excrement ruins market ears.

Life History

Some pupae are believed to overwinter on Long Island, the lower Hudson Valley, and a few spots in

western New York during certain winters where conditions are favorable. Moths that fly in from the South are largely responsible for the greater part of the infestations. In Ulster County and Long Island a few early moths appear in May; the first-brood worms may be found in the tassels in June before any silks are showing. A mature first-brood worm was found in the tassel

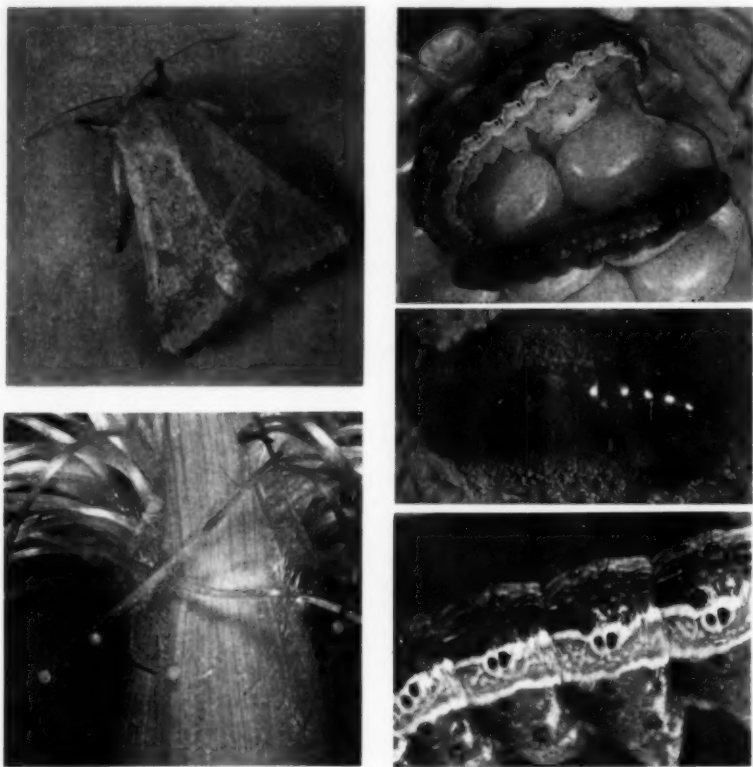


Figure 30. Corn earworm moth (top left); eggs on silk (bottom left); corn earworm larva and corn borer larva (top right); pupa in soil (center right); and segments of earworm to show small black spines (bottom right).

of sweet corn in Erie County as early as June 23.

In the lower Hudson Valley, the second-brood moths began flying the middle of July. This area usually experiences a great attack by the second-brood worms from late July through August. Another generation may follow in the lower Hudson Valley and Long Island.

In central and western New York, much of the early corn escapes earworm injury. Most injury is from the first-brood worms on mid- and late-season corn. Usually there is only one brood in these areas.

The moths are strong fliers and may suddenly appear in great numbers; they usually lay eggs on fresh silk. When the population pressure is high, eggs may be laid on many different parts of the corn plant whether silk can be seen or not. In both Long Island and the lower

Hudson Valley, earworms have been found to enter ears before the silks appear; this is very unusual for these areas and may be expected only in very severe infestations.

Larvae of the corn borer and the fall armyworm also may be found in sweet corn ears, but the corn earworm is the only larva covered with tiny black spines visible through a hand lens.

The eggs are usually laid by the moths on fresh silk, and hatch in about three days. The newly hatched worms pass through the silk channel, feeding along the way, to the kernels of the developing ear where feeding continues until larval development is complete. The worm usually cuts a circular emergence hole through the husk and drops to the soil to pupate. In two weeks moths emerge to lay eggs for another generation.

OTHER PESTS OF SWEET CORN

Fall Armyworm

The fall armyworm, *Laphygma frugiperda* (J. E. Smith), is often a corn pest in the lower Hudson Valley and on Long Island. The moths fly up from the South and no over-

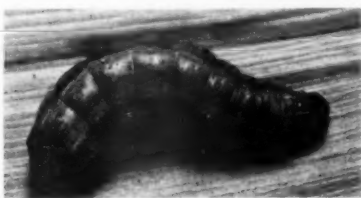


Figure 31. Fall armyworm larva on corn husk.

wintering takes place in the North. The moths first appear in the Hudson Valley at the end of July; most of them arrive in August. The larvae may feed upon the leaves and attack the ears in the same manner as the earworm; or they may enter the side of the ear. A second brood of worms appears the latter part of September or October. The larvae are similar to the earworm, but dull olive-brown in color.

Corn Leaf Aphid

The corn leaf aphid, *Rhopalosiphum maidis* (Fitch), is a plant

louse that is a dark blue-green color. Heavy populations of this aphid sometimes buildup on mid- and late-season varieties of sweet corn. Light or white silked varieties seem to be attacked more often than those varieties with dark silk. The presence of heavy aphid populations creates honeydew, sooty fungus develops and growers often report incomplete pollination.

Corn Sap Beetle

The corn sap beetles, *Carpophilus* species, have often been observed in objectionable numbers.

The insects may be found on the silk and in the tunnels made by worms that feed upon the stalks and the ears.

It is believed that this pest is usually a secondary invader which feeds on fermenting plant tissue. In years of heavy infestation, however, the pest may be a primary pest of market ears.

Seed Corn Maggot

This insect, which eats out the green and the soft interior parts of germinating corn and other vegetable seeds, is described on page 6.

TOMATO

Tomatoes are attacked by a number of insects. Young plants are sometimes chewed off at ground level by cutworms. Flea beetles injure newly set plants by eating numerous pinholes in the leaves. Potato beetles and their slugs may injure the foliage by their feeding. When the potato aphid develops in enormous numbers, it may retard plant growth by sucking the sap from the terminals and leaves. Hornworms are occasionally a pest; their feeding defoliates the plants. Tomato fruitworms feed on ripening tomato fruits.

Tomato Hornworm

Protoparce quinquemaculata
(Haw.)

Tobacco Hornworm

Protoparce sexta (Johan.)

Two species of hornworms are

destructive to tomato plants, the tomato hornworm and the tobacco hornworm. The adult moths, known as hawk moths or hummingbird moths, are large with wingspans of four to four and one-half inches. They are grey with white and dark markings. The adult moth of the tomato species has five sets of orange markings on the abdomen; the tobacco species has six sets of similar markings. The pupa is two inches long, hard shelled and mahogany brown. The larvae or actual hornworms of both species are difficult to tell apart when they are young. Older larvae are alike in size and form, but the tomato species has eight white, V-shaped marks on each side and the horn is black. The tobacco species has seven oblique white marks and the horn is red. When fully grown both species are three to four inches in length.

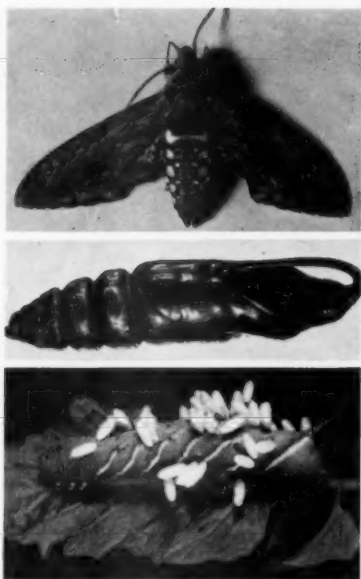


Figure 32. Tomato hornworm, adult moth (top), pupa (center) parasitized larva (bottom).

Damage

The larvae or hornworms are voracious feeders and may defoliate the plant by their feeding. Both species eat the leaves and also large areas from the fruit.

Life History

Large mahogany-colored pupae are sometimes dug or plowed up in the fall or spring; these are the overwintering stage of the tomato hornworm. The hawk moths appear in June and July to feed on the nectar of flowers and lay greenish yellow eggs singly on the lower side of the leaves. The larvae feed for about three to four weeks. There is a single generation each season.

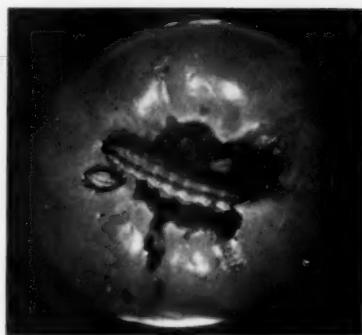


Figure 33. Tomato fruitworm larva on tomato fruit.

Tomato Fruitworm

Heliothis zea (Boddie.)

Various worms feed on tomato fruits. The most common are the fruitworms or corn earworms; they eat into the side of the tomato going from one fruit to another. The life history is given under corn insects.



Figure 34. Potato aphids on tomato.

Flea Beetles

Epitrix cucumeris (Harr.)

The potato flea beetle, a small black jumping beetle, attacks tomato plants in the plant bed or as soon as they are set in the field. These beetles feed on the plants and produce pinholes in the leaves. Young newly set plants suffer serious damage that reduces the vigor of the

plants and either retards their growth or kills them.

Aphids

Species of aphid that attack potatoes also attack tomatoes. The pink and green potato aphid, *Macrosiphum solanifolii* (Ashm.), is the most common pest.

OTHER PESTS OF TOMATO

Cutworms

Cutworms are often troublesome to newly set tomato plants. The larvae of these night-flying moths cut the young plants off at ground level.

Colorado Potato Beetle

The adults and larvae of this potato pest sometimes attack tomatoes in the market gardening areas.

Drosophila

Fruit flies are occasionally a problem when tomatoes are being harvested. The flies lay tiny eggs in the cracks of fruit that is damaged or contains growth cracks. The eggs and larvae constitute a contaminant in tomato packing plants and their presence as insect fragments may result in condemnation of packed tomato products. The insect is not a problem every year.

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